SDMS DocID 479301

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
ONE CONGRESS STREET SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

December 18, 2009

Tim Cosgrave
Harvard Project Services LLC
249 Ayer Road, Suite 206
Harvard, MA 01451-1132

Re: EPA review of UniFirst's draft VI Scope of Work, dated October 9, 2009

Dear Mr. Cosgrave:

EPA, in consultation with MassDEP, has reviewed your "Indoor Air Quality and Vapor Intrusion Assessment Scope of Work", submitted on October 9, 2009, for the UniFirst Source Area Property (15 Olympia Avenue, Woburn, MA). This Scope of Work (SOW) proposed the collection of sub-slab soil gas, indoor air, and upwind atmospheric samples to assess vapor intrusion and indoor air quality within the existing building on the property.

EPA anticipates that this vapor intrusion work will be completed in 2010, and looks forward to UniFirst initiating the soil investigations to determine the extent of contamination and parameters for designing a soil remediation system to achieve ROD and Consent Decree soil cleanup levels within the schedule outlined in the 2009 Five Year Review.

Please find attached EPA's comments on the SOW. The most significant aspects of the comments relate to the following:

- Adding an additional sampling location in the office space area for helping assess potential current risk to workers (see attached figure) and potential vapor intrusion pathways including along the sewer lines;
- Adding an additional sampling location in the pump room for helping assess potential risks and potential vapor intrusion pathways including the waterline (e.g. UC-22 extraction water line) (see attached figure);
- Adding two additional sampling locations, the first by UC35 (highest previous tetrachloroethene [PCE] soil concentration (3,400 ug/kg) under the building foundation) and the second by UC32 (near highest PCE soil concentrations (120,000 ug/kg) at TPI and TPM). It is suggested SV-13 and SV-12 be relocated to these locations (see attached figure);
- The analyte compound list may need to be expanded to account for previously detected compounds found on the UniFirst property and associated with oily waste. The methods of analysis should have sufficiently low detection limits to account for Incremental Life Cancer Risk (ILCR) equal to 1E-06 or Hazard Quotient (HQ) equal to 0.1;
- Shallow groundwater monitoring shall be expanded to include all monitoring wells situated on the eastside of the UniFirst property including UC4, UC5, UC8, UC16, UC17, UC20, UC27 and

UC28. It is anticipated that the water table elevation may be within shallow bedrock for many of these monitoring wells considering the overburden in this area is very shallow;

- Water level and groundwater sampling should be coordinated with the initial vapor intrusion assessment downgradient/nearby the UniFirst and WR Grace source area properties;
- EPA requires two rounds of sampling to evaluate vapor intrusion within the building. One during frozen ground conditions in February 2010, and a second around August 2010.

EPA also sent you a recent email requesting some further information regarding the specific locations of historical operations on the property. This type of information will be helpful at further understanding operations on the property and potential areas of environmental concern on the property.

We look forward to this work plan being finalized and conducting the initial round of soil gas and indoor air sampling in February 2010 followed by the shallow groundwater sampling. If you would like to discuss the comments further, please contact me at 617.918.1323, or we can schedule a meeting or conference call.

Sincerely,

Joseph F. LeMay

Joseph F. LeMay, P.E.
Office of Site Remediation and Restoration

cc: Bob Cianciarulo, EPA
Cindy Lewis, EPA
Margaret McDonough, EPA
Peter Kahn, EPA
Steve DiMattei, EPA
Scott Huling, EPA ORD
Joe Coyne, MassDEP
Jennifer McWeeney, MassDEP
David Sullivan, TRC Solutions
Clayton Smith, demaximis

EPA comment on
UniFirst's draft VI Scope of Work dated October 9, 2009

1) **Page 8, Section 5.** All building doors and windows should be closed 24 hours before testing and during testing within the building. Please also provide a complete description on how the ventilation system normally operates within the building during the seasons targeted for sampling including the various zones of ventilation within the building and number of air exchanges within these zones/building.

2) **Page 8, Section 5; and Figure 4.** Additional sub-slab soil gas and indoor air sampling locations are proposed for the following locations:

   - Adding an additional sampling location in the office space area for helping assess potential current risk to workers and potential vapor intrusion pathways including along the sewer lines. EPA has observed that utilities entering buildings can serve as vapor pathways subsurface pathways. It is suggested that the sample be collected from the bathroom or hallway next to the bathroom door (with the bathroom doors remaining open). See the attached figure for the additional SV location along the north side of the office area;
   - Adding an additional sampling location in the pump room for helping assess potential risk and potential vapor intrusion pathways including along the water line/ utilities (e.g. UC-22 extraction water line. EPA has observed that utilities entering buildings can serve as vapor pathways subsurface pathways. The waterline was excavated through an area with high voc contamination and may be a migration pathway to the building. See the attached figure for the additional SV location in the pump room;
   - Adding two additional sampling locations, the first by UC35 (highest previous PCE soil concentration (3,400 ug/kg) under the building foundation) and the second by UC32 (near highest PCE soil concentrations (120,000 ug/kg) at TPI and TPM). EPA suggests relocating SV-13 and SV-12 to the UC35 and UC32 areas. See the attached figure for the additional SV locations (including the relocation of SV-12 and SV-13 to nearby UC-35 and UC-32.

3) **Page 8, Section 5; and Figure 4.** EPA proposes adjusting the location of SV-02 approximately 25' north along the ally, and adjusting the location of SV-09 approximately 25' northwest along the ally. See attached figure for adjusted locations of SV-02 and SV-09.

4) **Page 8, Section 5; and Figure 4.** The "pump room" identified on Figure 4 is the location of the treatment facility for the pump and treat system on the property. The water line transporting water from extraction well UC22 to the pump room was excavated through an area with high VOC concentrations. As outlined in comment # 2, EPA recommends an additional SV sample be located in the pump room to help assess potential risk and potential vapor intrusion pathways. In addition, data collected from the pump room may also provide an understanding if contamination in the pump room may be interfering with other nearby SV sample locations (e.g., SV-10, SV-07).

5) **Page 8, Section 5 - 5th bullet; and Figure 4.** Water level measurements and shallow groundwater samples shall also be collected from monitoring wells along the eastern boundary of the property, including monitoring well locations UC4, UC5, UC8, UC16, UC17, UC20, UC27 and UC28. Note: the water table elevation on the eastside of the property may be within shallow bedrock because the overburden in this area is very shallow.

6) **Page 7, Section 5, Chemicals of Concern.** Section 5.0 proposes a limited suite of compounds for analysis as part of this effort. EPA desires comprehensive analysis based on volatile compounds detected during historical data collection at the property. In addition to those compounds listed in Table 1, the following volatile organic compounds (VOCs) have been detected in UniFirst monitoring wells and warrant consideration:

- 1,1,2,2-tetrachloroethane
- 1,1,2-trichloroethane
- 1,1-dichloroethene
- 1,2,4-trimethylbenzene
- 1,2-dibromoethane
- 1,2-dichloropropene
- 1,3,5-trimethylbenzene
- 2-butanone
- 2-hexanone
- 4-methyl-2-pentanone
- acetone
- benzene
- bromoform
- bromomethane
- carbon disulfide
- carbon tetrachloride
- chlorobenzene
- chloroethane
- dibromochloromethane
- ethylbenzene
- isopropylbenzene
- meta- & para-xylenes
- ortho-xylene
- xylenes (total)
- methylene chloride
- n-Propylbenzene
- styrene
- toluene
- trans-1,3-dichloropropene

7) **Section 5, Detection Limits for Ambient Air and Soil Gas Sampling.** Clarify the detection limits for soil gas and ambient air sampling. The air detection limits should be less than the Oak Ridge National Laboratory (ORNL) residential air screening levels, adjusted to a Hazard Quotient (HQ) of 0.1 for non-carcinogens and as reported for carcinogens. For compounds labeled with a "**" on the ORNL Regional Screening Level Table, the noncancer and cancer values are within 10-fold of each other. For these compounds, the background table that provides both the noncancer and cancer values should be consulted to determine whether the noncancer value adjusted downward by 10-fold is lower than the cancer value. The lower of the two values (HQ=0.1 or ILCR=1E-06) should be selected as the screening level. See comment 33 and the attached vapor intrusion screening criteria table for air and groundwater. Note: For

compounds on the table where "no value available" is denoted, their detection limits should be 0.5 ug/m^3 and 0.5 ug/L.

8) **Section 5, Data Validation.** Clarify the details of data validation. See related comments regarding data validation in Section 6.

9) **Section 5, Expand Analytical Program.** Air phase petroleum hydrocarbons (APH) should be added to the analytical program for the soil gas samples since UniFirst reported "waste-oil contaminants" released on the property.

10) **Section 5, Well Integrity.** Wells with insufficient integrity will need to be restored to working order or replaced and kept in the sampling program. Related integrity testing conducted for the parallel investigation conducted in the neighborhood area and the nearby office park includes slug testing to confirm the hydraulic connection of the wells to the saturated unconsolidated deposits. This information may be useful for determining if the wells need to be re-developed.

11) **Section 5, Passive Diffusion Bag (PDB) Sampling.**

- **Representativeness.** The text suggested that diffusion samplers would be deployed at a depth up to one foot below the water table. The diffusion sampler may be in place for a three week period or longer. It is recommended that diffusion samplers, and any other deployed sampling device, be consistently located within a vertical elevation that will receive free flowing groundwater from the adjacent well screen close to the water table without concern for water table fluctuations where the water level may drop and partially expose the sampling device to non-free flowing conditions and/or air. It is suggested that the diffusion bag samplers be situated at a greater depth below the water table so the samples remain within the free flowing groundwater conditions by the water table (e.g., 2'-3' below the water table). The vertical location of the sampling device should be consistently applied to monitoring wells throughout the study area.

  Otherwise, deploying the PDB within the top foot of the groundwater table may lead to a result that is biased low. With the sampler installed close to the water surface, over the two to three week period wherein the sampler is deployed, the water table may fall below the installation depth of the PDB, potentially exposing the sampler to the air within the well casing. In addition, the water at that depth may be equilibrated with column of air within the well, rather than the reduced pore area of the adjacent formation. The PDB should be installed at a depth that guards against water table fluctuations and localized air/water equilibrium affects. If a sampler is to be installed within the top foot of the water column, then additional PDB samplers should be deployed below the sampler to evaluate potential concentration bias. Please apply the USGS's "User's Guide for Polyethylene-Based Passive Diffusion Samplers to Obtain Volatile Organic Compound Concentrations in Wells" for the proposed VI SOW groundwater sampling program. A copy of the USGS user guide can be found at the following link - http://costperformance.org/pdf/wrir014060.pdf

- **Proximity to screen interval.** Provide a table that summarizes the wells proposed for sampling, surface elevation (where installed), measured groundwater elevation range, screen interval elevations, and formation screened. Also indicated the proposed installation elevation of the PDB sampler. Following the proposed installation scheme, if the PDB becomes located above the screened interval (in the potentially stagnant water column), then the depth of PDB placement should be adjusted to have the PDB placed within the screened interval where groundwater freely flows through the screen.

12) **Section 5, Certified Analytical Laboratories.** Section 5.0 mentions that samples will be sent to a "certified" analytical laboratory. Clarify by whom and for what the laboratories will be certified.

13) **Section 5, Sub-Slab and Indoor Air Summa Canister Sampling SOPs:** EPA Region 1 uses the attached Standard Operating Procedures (SOP) for "Canister Sampling" dated August 31, 2007. Please use this SOP as a guide. Please also provide a copy of your sampling SOPs with the resubmission of the VI SOW.

14) **Section 5, Sub-Slab SOP:** The proposed sub-slab soil gas sampling procedures should include the following:
    - a purge volume of three to five internal volumes of tubing/probe should be removed prior to sampling;
    - place a small amount of modeling clay around the stainless steel tubing adjacent to the Swagelok nut, which connects the stainless steel tubing to the female connector. Use a sufficient amount of clay so that the completed probe, when placed in the outer hole, will create a seal between the outer hole and inner hole. The clay seal will prevent any anchoring cement from flowing into the inner hole during the final step of the probe installation and also help prevent indoor air from diluting the soil gas sample. Please also provide a copy of your sampling SOPs with the resubmission of the VI SOW.

15) **Page 9, Section 5, ASTM Procedure.** The ASTM method identified in the text is outdated and has been superseded by ASTM D-5466-01(2007).

16) **Page 11, Section 5, Composite Sub-Slab Sampling.** The collection of an 8-hour composite sample for sub-slab vapor samples does not appear to be appropriate. Samples of this kind are typically collected at 200 milliliters per minute (mL/min) until the canister is filled. It is not necessary to obtain "time weighted average" samples of sub slab soil gases. However, care should be exercised to avoid sampling at too high a rate or via too high a vacuum, as this can lead to short-circuiting. The California EPA and US EPA recommend a maximum sampling rate of 0.1 to 0.2 Liters/minute. Empirical and mathematical evaluations of "purge volume" concerns indicate that pre-evacuation of 5 probe volumes should suffice. The proposed pre-evaluation of 3 probe volumes appears appropriate.

17) **Section 5, Groundwater Sampling - 1,4-Dioxane Analysis.** Clarify that groundwater analysis includes 1,4-dioxane due to the elevated concentrations and historical releases of 1,1,1-trichloroethane at the UniFirst property. In addition, see above comment regarding chemicals of concern.

18) **References.** One of the cited references is out of date (USEPA 2002b; Region 9 PRGs) and should be updated in the text (Section 6, page 16, last paragraph) to reference the ORNL screening values. The ORNL regional screening level table was most recently updated in May 2009 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm).

19) **Page 9, Section 5.** It is strongly recommended that the inside and outside building be thoroughly visually inspected, documented, and assessed for chemical storage areas that could interfere with

indoor air sampling results. Chemical storage areas identified may also be further evaluated with PID (although this information will not provide any chemical specific information). Chemicals identified within chemical storage areas may be temporarily removed from the building prior to sampling.

20) **Page 9, Section 5.** How will predominant outdoor air direction be determined and monitored prior to and during sampling?

21) **Page 10 and 11, Section 5.** Cracks between floors and walls may have developed over time and caused some floor separation from the walls. These cracks, and other significant floor cracks, should be monitored with PID to evaluate potential locations of interest where VOCs may be entering the building.

22) **Page 10, Section 5.** As appropriate, final sub-slab and indoor air sampling locations may be adjusted prior to sampling. EPA shall review all field results and recommendations for adjusting sample locations along with UniFirst and/or Johnston Company Representatives prior to sample collection. EPA should be notified of building inspection schedule at least 1 week prior to inspection.

23) **Page 10, Section 5.** The parties proposed approach for determining a successful seal is < 20% of tracer gas detected with handheld meter. This percentage appears unacceptably high. Recent research from EPA ORD on the matter of leakage suggests </= 1% of the tracer gas detected is more appropriate for determining a successful seal.

24) **Page 11, Section 5.** The SOW and EPA's comments are focused on sub-slab and indoor air conditions within the building footprint, and suggests that the proposed SV-12 and SV-13 be relocated within the building foot print by historical sampling locations UC-35 and UC-32 (see attached figure). EPA expects future plans will be provided for further characterizing the extent of soil contamination on the property and properly designing a soil remedy to achieve ROD and Consent Decree soil cleanup levels.

25) **Page 11, Section 5.** In Section 5.0, under Sub-Slab Vapor Assessment, the fifth paragraph identifies a duplicate sample will be collected at two of the sub-slab vapor monitoring points. The procedure used to collect the duplicate sample needs to be provided.

26) **Page 12, Section 5.** As noted in a prior comment, the groundwater table should be monitored in the shallow bedrock monitoring wells along the eastern portion of the property (UC4, UC5, UC8, UC16, UC17, UC20, UC27 and UC28).

27) **Page 12, Section 5.** The snap sampler web page states, "Academic research, EPA, and ASTM guidance indicates flow-through in the well screen is normal and usual." In most circumstances truly "stagnant" water is present only in blank well casing above the screen. The screen interval inside the well normally contains free flowing formation water." According to the Interstate Technology Regulatory Council, Passive Diffusion Bag (PDB) samplers "rely on the free movement of groundwater from the aquifer or water bearing zone through the well screen." Please inventory and identify the vertical elevation of the well screen, water table and the elevation the proposed sample will be collected from. Please ensure that all samples are collected from free flowing water and representative of current aquifer conditions. If the sample is collected from a location above the well screen, then the sample may not be representative of free

flowing water from the aquifer by the water table. For these locations, it may be appropriate to install new monitoring wells where the screen interval intersects the water table level and the interval targeted for sampling. Otherwise, the samples should be collected from an appropriate elevation within the screened interval where the water is free flowing from the aquifer.

28) **Page 12, Section 5.** If at all possible, the groundwater sampling under this scope of work should be coordinated with and occur at the same time as the sampling proposed under the Vapor Intrusion Assessment Work Plan (shallow groundwater sampling from monitoring wells downgradient of the UniFirst and WR Grace Source Area Properties). In addition, the methodology for sampling existing monitoring wells under this SOW and the Vapor Intrusion Assessment Work Plan should be consistent.

29) **Page 12, Section 5, Analytical Methods; and Section 6, Quantitation Limits.** The VOC groundwater analyses by 8260 specified in Section 5 of the LTMP will not be satisfactory to achieve EPA's VI Screening criteria (provided herein). As per Section 6, Table 6-2, the Quantitation Limit (QL) for most VOCs is 2 micrograms per liter (ug/L); therefore, 8260B analysis using selective ion monitoring (SIM) will be needed for trans-1,2-dichloroethene, 1,2-dichloroethane, chloroform, vinyl chloride, and tetrachloroethene.

30) **Page 12, Section 5.** Groundwater, soil gas, and indoor/outdoor air samples should be analyzed for VOCs identified in Table 1, as well as any other VOCs that historically have been found on the property in groundwater and soil media which may contribute to potential vapor intrusion/ indoor air risks. See above comment regarding chemicals of concern and 1,4-dioxane.

31) **Section 6, Validation.** The first paragraph in this section does not clearly state that data will be validated. If validation is intended (as indicated in the third paragraph in this section), then the guidelines that will be used should be cited here consistent with EPA Region 1 – New England data validation procedures. The level of validation that will be performed must also be cited.

32) **Section 6, Data Usability.** The second paragraph states that the data set for the project will be considered useable if no more than 10-percent of the data are rejected. This is not an acceptable criterion for determining if the data are useable. There could also be low or high biases in the data that may not result in rejection of the data, but will result in the inability to achieve the project objectives. Also, even if less than 10-percent of the data are rejected, the data points which are rejected may be critical to achieving the project objectives. Therefore, this general usability statement is not accurate.

33) **Section 6, Data Comparison/VI Screening Levels.** EPA vapor intrusion screening criteria is based upon Incremental Life Cancer Risk (ILCR) of 1E-06 and Hazard Quotient (HQ) of 0.1. The table provided below includes the VI Screening Criteria (ug/L) for each volatile organic compound (VOC) of interest based upon ILCR equivalent to 1E-06 or HQ equivalent to 0.1, which shall be used for this initial vapor intrusion study. Selective Ion Monitoring (SIM) analysis will likely be required for trans-1,2-dichloroethene, 1,2-dichloroethane, chloroform, vinyl chloride, and tetrachloroethene to achieve the tabulated VI Screening Criteria.

Compound of Interest	**Indoor Air VI Screening Criteria (ug/m^3)**	**Basis of Screening Criteria**	**Groundwater VI Screening Criteria (ug/L)**	**Basis of Screening Criteria**

Chloroform	1.1E-01	ILCR = 1E-06	0.705	ILCR = 1E-06
1,1-Dichloroethane	1.5E+00	ILCR = 1E-06	6.61	ILCR = 1E-06
1,2-Dichloroethane	9.4E-02	ILCR = 1E-06	2.34	ILCR = 1E-06
1,1-Dichloroethene	2.1E+01	HQ = 0.1	19	HQ = 0.1
Tetrachloroethene	4.1E-01	ILCR = 1E-06	0.55	ILCR = 1E-06
Trichloroethene	1.2E+00	ILCR = 1E-06	2.89	ILCR = 1E-06
Vinyl chloride	1.6E-01	ILCR = 1E-06	0.32	ILCR = 1E-06
trans-1,2-Dichloroethene	6.3E+00	HQ = 0.1	18	HQ = 0.1
cis-1,2-Dichloroethene	No value available		21	HQ = 0.1
1,1,1-Trichloroethane	5.2E+02	HQ = 0.1	310	HQ = 0.1
Methylene chloride	5.2E+00	ILCR = 1E-06	58	ILCR = 1E-06
2-Butanone	5.2E+02	HQ = 0.1	44,000	HQ = 0.1
Acetone	3.2E+03	HQ = 0.1	22,000	HQ = 0.1
Carbon tetrachloride	1.6E-01	ILCR = 1E-06	0.135	ILCR = 1E-06
Carbon disulfide	7.3E+01	HQ = 0.1	56	HQ = 0.1
Xylenes	1E+01	HQ = 0.1	2,200	HQ = 0.1
Toluene	5.2E+02	HQ = 0.1	150	HQ = 0.1
Chlorobenzene	5.2E+00	HQ = 0.1	39	HQ = 0.1
Styrene	1.0E+02	HQ = 0.1	890	HQ = 0.1
1,1,2,2-Tetrachloroethane	4.2E-02	ILCR = 1E-06	3	ILCR = 1E-06
1,2-Dichloropropane	2.4E-01	ILCR = 1E-06	2.12	ILCR = 1E-06
n-Propylbenzene	No value available		32	HQ = 0.1
1,1,2-Trichloroethane	1.5E-01	ILCR = 1E-06	4.11	ILCR = 1E-06
1,2,4-Trimethylbenzene	0.73	HQ = 0.1	2.4	HQ = 0.1
1,3,5-Trimethylbenzene	0.63	HQ = 0.1	2.5	HQ = 0.1
1,2-Dibromoethane	4.1E-03	ILCR = 1E-06	0.36	ILCR = 1E-06
1,2-Dichloropropene	No value available		No value available	
2-Hexanone	3.1E+00	HQ = 0.1	787	HQ = 0.1
4-Methyl-2-pentanone	3.1E+02	HQ = 0.1	1,400	HQ = 0.1
Benzene	3.1E-01	ILCR = 1E-06	1.36	ILCR = 1E-06
Bromoform	2.2E+00	ILCR =	0.0083	ILCR =

		1E-06		1E-06
Bromomethane	5.2E-01	HQ = 0.1	2	HQ = 0.1
Chloroethane	1E+03	HQ = 0.1	2,800	HQ = 0.1
Dibromochloromethane	9E-02	ILCR = 1E-06	3.2	ILCR = 1E-06
Ethylbenzene	9.7E-01	ILCR = 1E-06	3.04	ILCR = 1E-06
Isopropylbenzene	4.2E+01	HQ = 0.1	0.84	HQ = 0.1
trans-1,3-Dichloropropene	No value available		0.84	ILCR = 1E-06
Naphthalene	7.2E-02	ILCR = 1E-06	3.98	ILCR = 1E-06
1,2-Dichlorobenzene	2.1E+01	HQ = 0.1	260	HQ = 0.1
1,3-Dichlorobenzene	No value available		No value available	
1,4-Dichlorobenzene	2.2E-01	ILCR = 1E-06	2.25	ILCR = 1E-06
Tetrahydrofuran	No value available		No value available	
Bromodichloromethane	6.6E-02	ILCR = 1E-06	2.1	ILCR = 1E-06

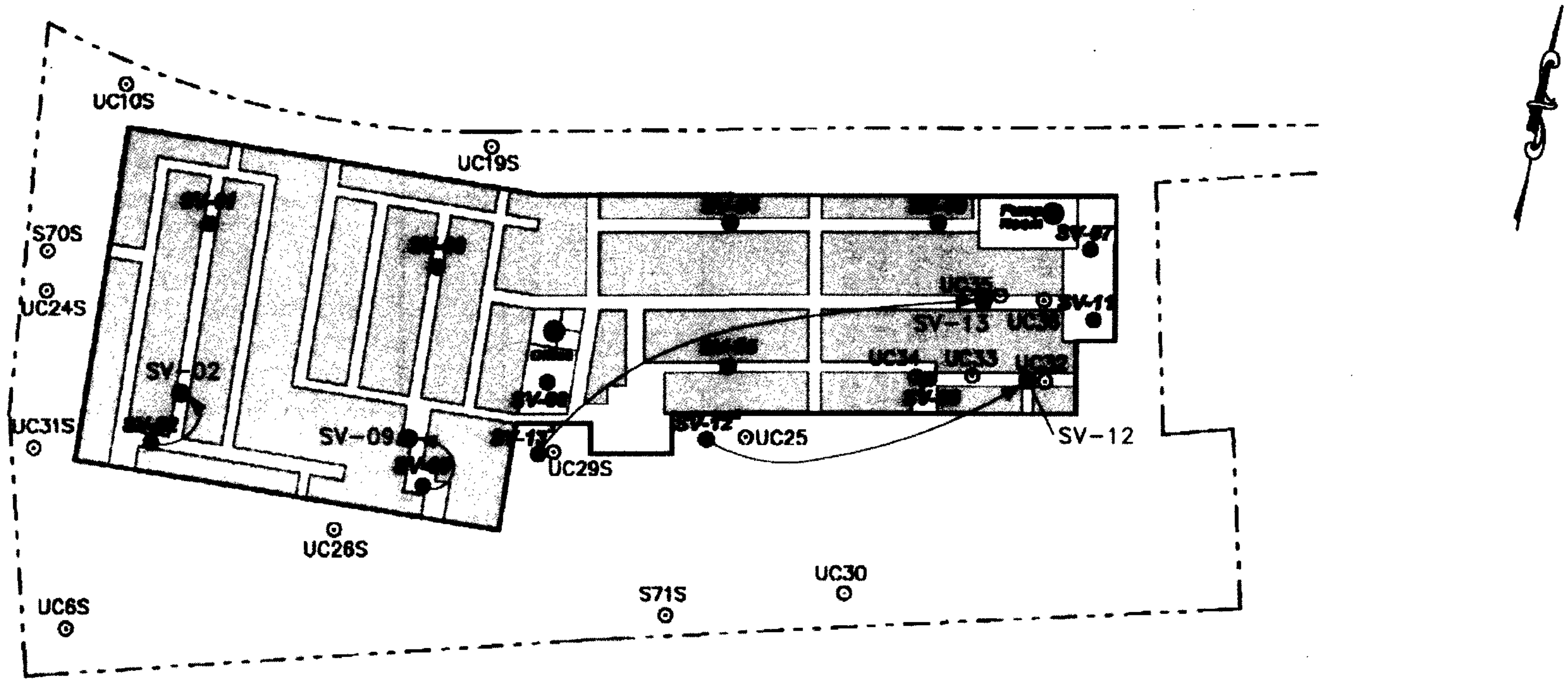
Notes:
ug/L – microgram per liter
ILCR – Incremental Lifetime Cancer Risk
HQ – Hazard Quotient

34) **Page 13, Section 6.0.** In Section 6.0, the last paragraph indicates validated data will be used to evaluate the current risk exposure using a commercial worker standard consistent with relevant USEPA guidance. EPA will make the final determination regarding current and future unacceptable risks at the source area property. All validated data shall also be provided to the EPA in excel/ access data base form (form 1 electronic tables).

35) **Page 13, Section 6.0.** Please include a Quality Assurance Project Plan (QAPP) and relevant Standard Operating Procedures for the scope of work.

36) **Page 13, Section 7.0.** As indicated in EPA's September 18, 2009 email to Tim Cosgrave, it is anticipated that multiple rounds of sampling may be necessary due to considerable seasonal variability with soil gas, indoor air and groundwater results. The initial sub-slab soil gas, indoor air and shallow groundwater samples should be collected in February 2010 while the ground is frozen during winter conditions and around August 2010 during summer conditions. Shallow groundwater level measurements and sampling shall occur within a few weeks after the sub-slab and indoor air sampling has been completed.

37) **Page 13, Section 7.** Please coordinate directly with EPA and its oversight contractor, TRC, regarding the field schedule of all activities including assessment of existing monitoring wells and evaluating the conditions inside the building (prior to the initiation of field work).



LEGEND

SV-01 ● PROPOSED COLOCATED SUB-SLAB / INDOOR AIR VAPOR SAMPLING LOCATION[1]

UC6S ⊙ EXISTING MONITORING WELL SAMPLING LOCATION

BUILDING FOOTPRINT

SITE BOUNDARY

APPROXIMATE STORAGE AREA FOOTPRINT

SV-02 / SV-02 RECOMMENDED MOVES

● ADDITIONAL SUB-SLAB/INDOOR AIR VAPOR SAMPLING LOCATION

APPROXIMATE GRAPHIC SCALE

0' 25' 50' 100'

NOTES:

DRAWING BASED ON "PROPOSED SAMPLING LOCATIONS UNIFIRST CORPORATION WOBURN, MASSACHUSETTS" BY THE JOHNSON COMPANY, MONTPELIER, VT DATED SEPTEMBER 2009.

WELLS UNIFIRST
WOBURN, MASSACHUSETTS

PROPOSED
SAMPLING POINT RELOCATIONS

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

FIGURE 1

DRAWN BY: HWB
CHECKED BY: L O'C
DATE: DEC 2009

FILE: T:\E_CAD\104161\WOBURN\PROP SAMP RELOC UNI 12-01-09.dwg

CANISTER SAMPLNG
STANDARD OPERATING PROCEDURE

Office of Environmental Measurement and Evaluation
Ecosystems Assessment Team
EPA New England-Region 1
11 Technology Dr.
North Chelmsford, MA 01863

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Prepared by: Peter Kahn
Peter Kahn, Environmental Engineer
Date: 9/6/07

Reviewed by: Allen Oi
Allen Oi, ECA Air Section QAO
Date: 9/11/07

Approved by: N Beloin
Norm Beloin, ECA Air Section Team Leader
Date: 9/11/07

Note: The effective date is considered to be the last approval date.

Revision Page

Date	Rev. #	Summary of Changes	Sections
8/31/07	4	New format applied	All sections

Table of Contents

1.0 Scope and Application

The purpose of this Standard Operating Procedure (SOP) is to describe the procedures for sampling volatile organic compounds (VOCs) in ambient or indoor air environments. The samples are collected as whole air samples in passivated SUMMA' or Silco lined stainless steel canisters. The VOCs are subsequently separated by gas chromatography (GC) and measured by an ion trap mass spectrometer (MS) at the EPA Region I New England Regional Laboratory. The laboratory analytical operating procedures for the GC/MS are described under separate cover.

The canister sampler configuration and procedure, the number of samples to be collected, where they are collected, and the duration of the sampling event, are dependent upon the project objectives. Therefore, prior to field sampling activities, a detailed sampling and analysis work plan is prepared for each project. The plan will incorporate the procedures specified in the following SOP document.

The sampling procedures are described in three separate parts. Part 1 describes the grab sampler configuration and sampling procedures, Part 2 the sub-atmospheric time-integrated sampler configuration and sampling procedures and Part 3 the pressurized time-integrated sampler configuration and sampling procedures.

2.0 Summary of Method

This canister sampling SOP describes procedures for sampling with canisters at final pressures above atmospheric pressure (referred to as pressurized sampling), below atmospheric pressure (referred to as sub-atmospheric sampling), and at atmospheric pressure (referred to as grab sampling). This method is applicable to specific VOCs that have been tested and determined to be stable when stored in pressurized and sub-atmospheric pressure canisters. The organic compounds that have been successfully collected in canisters by this method are listed on Table 1.

3.0 Definitions

3.1 QAO: Quality Assurance Officer

3.2 QC: Quality Control

3.3 QA: Quality Assurance

3.4 SOP: Standard Operating Procedure

3.5 NA: Not applicable

3.6 PDF: Portable document format

3.7 SIGNIFICANT REVISION: a change in documented procedure that will likely alter the outcome of the task.

3.8 ECA: Ecosystems Assessment

3.9 VOC: Volatile Organic Compound

3.10 GC/MS: Gas Chromatography and Mass Spectrometer

3.11 QA/QC: Quality Assurance and Quality Control

3.12 OSHA: Occupational Safety and Health Administration

3.13 psig: Pounds per Square Inch Gauge

3.14 psia: Pounds per Square Inch Absolute

3.15 ml/min: milliliters per minute

4.0 Health and Safety Warnings

4.1 When working with potentially hazardous materials or situations, follow EPA, OSHA and site specific health and safety procedures.

4.2 All proper personal protection clothing for the specific task must be worn.

5.0 Interferences

5.1 Do not handle sources of VOCs, such as gasoline or other solvents prior to collecting samples with canisters. These may contaminant the canisters and interfere with sampling results.

6.0 Personnel Qualifications

6.1 All personnel should be trained by an experienced individual before initiating the procedures on their own.

6.2 All personnel working in the field at Superfund Sites are required to take a 40-hour health and safety training course and an annual refresher course prior to engaging in any field activities.

6.3 All personnel shall be responsible for complying with all quality assurance and quality control (QA/QC) requirements that pertain to their organization/technical function.

PART 1
Canister Grab Sampler Configuration and Sampling Procedures

7.0 Equipment and Supplies

See Figure 1 for a diagram of the canister grab sampling system.

7.1 Sampling inlet line is made of chromatographic-grade stainless steel tubing to connect canister to sample inlet.

7.2 Sample canister is a stainless steel pressure vessel of desired volume (6-liter or 15-liter) with valve and either a SUMMA passivated or Silco lined interior surface. All canisters mush be certified clean, leak free and evacuated prior to sampling event. Canisters can be purchased from Scientific Instrumentation Specialists (SIS), Andersen Instruments Inc., RESTEK, or equivalent. A vacuum/pressure gauge (0-30 in Hg and 0-30 psig) can be attached to canister as an option.

7.3 A separate vacuum/pressure gauge is used if not attached to the canister for taking vacuum/pressure readings before and after the sampling event.

7.4 A 2 micrometer stainless steel in-line particulate matter filter (Nupro Co., Model SS4F-2, or equivalent) is attached to sample inlet line.

8.0 Procedures

The standard operating procedure (SOP) described below outlines the procedures used for collecting an instantaneous grab canister sample. Configure the sampler as shown in Figure 1 using the components described in Section 7.0.

8.1 If the canister does not have a vacuum/pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and remove the gauge.

8.2 If a vacuum/pressure gauge is attached, open valve, read the gauge, and then close the valve.

8.3 Connect the 2 micrometer particulate matter filter and sampling line to the canister inlet as shown in Figure 1. The flow controller shown will not be needed for collecting a grab sample.

8.4 Open the canister valve slightly, just enough to slowly allow a sample to be drawn into the canister. The canister pressure differential causes the sample to flow into the canister. It will take approximately 30 seconds for the canister pressure to go from 30 psig vacuum to atmospheric pressure or 0 gauge.

8.5 In a field log book record the project name, sampling event date, sampling location, canister number, initial canister pressure gauge reading, and the sampling start time.

8.6 Close the canister valve. **DO NOT OVER-TIGHTEN THE VALVE.**

8.7 Disconnect the 2 micrometer particulate matter filter from the canister inlet.

8.8 If the canister does not have a vacuum/pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister.

8.9 If a vacuum/pressure gauge is attached, open valve, read the gauge, and then close the valve.

8.10 In a field log book record the final canister pressure gauge reading and the meteorological conditions during the sampling event.

8.11 For each sample fill in the tag attached to the canister within the following information: Date Sampled & Pressure (psig), see Appendix A

8.12 Complete the chain-of-custody record form. See Section 14.5.

PART 2
Canister Sub-atmospheric Time-Integrated Sampling Procedures

9.0 Equipment and Supplies

See Figure 2 for a diagram of the canister sub-atmospheric time-integrated sampling system.

9.1 Sampling inlet line is made of chromatographic-grade stainless steel tubing to connect canister to sample inlet.

9.2 Sample canister is a stainless steel pressure vessel of desired volume (6-liter or 15-liter) with valve and either a SUMMA passivated or Silco lined interior surface. All canisters mush be certified clean, leak free and evacuated prior to sampling event. Canisters can be purchased from Scientific Instrumentation

Specialists (SIS), Andersen Instruments Inc., RESTEK, or equivalent. A vacuum/pressure gauge (0-30 in Hg and 0-30 psig) can be attached to canister as an option.

9.3 A separate vacuum/pressure gauge is used if not attached to the canister for taking vacuum/pressure readings before and after the sampling event.

9.4 A 2 micrometer stainless steel in-line particulate matter filter (Nupro Co., Model SS4F-2, or equivalent) is attached to sample inlet line.

9.5 A mechanical flow controller made of stainless steel; having a flow range of 2- 4 ml/min (Restek Veriflow model 423XL or equivalent) is calibrated to 3.3 ml/min. using a 6-liter canister to collect a 24-hour integrated sample.

9.6 A mechanical flow controller made of stainless steel; having a flow range of 5-500 ml/min (Millaflow model 423SXVT/HT or equivalent) is calibrated to 10 ml/min. using a 6-liter canister to collect an 8-hour integrated sample.

9.7 An Aalborg Electronic Mass Flow Meter (Model GFMs-010020) is used to calibrate the flow controller. The mass flow meter measures flow rates between 0 - 20 ml/min.

10.0 Procedures

The standard operating procedure (SOP) described below outlines the procedures used for collecting a sub-atmospheric pressure integrated canister sample. Configure the sampler as shown in Figure 2 using the components described in Section 9.0.

10.1 In the laboratory, prior to the sampling event, calibrate the flow controller using the procedure outlined in Section 14.1. **Note: For this procedure use an evacuated dummy canister.**

10.2 Select the canister and flow controller to be used for the sampling event and bring it to the desired sampling location. If the canister <u>does not have</u> a vacuum/ pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister. If the canister to be used for the sampling event <u>does have</u> a vacuum/pressure gauge attached, read the gauge and record value and canister number in field log book.

10.3 Connect the sample inlet line with particulate matter filter to the flow controller's high pressure inlet port (HP), if not already configured and the low pressure outlet port (LP) to the canister inlet port as shown in Figure 2 using the components described in Section 9.0.

10.4 In a field log book record the project name, sampling event date, sampling location, canister number, flow controller number, and the initial canister pressure gauge reading.

10.5 After all of the samplers have been set-up at their desired sampling locations, go back to each location and open the canister valve to allow a sample to be drawn through the flow meter and into the canister. The canister pressure differential causes the sample to flow into the canister. In the field log book record the sampling event start time for each sampling location.

10.6 During the course of the sampling event, periodically check each sampling location to see if the sampler had been tampered with. In addition, if the canister has a vacuum/pressure gauge attached, observe and record the gauge reading to determine if the canister is being filled at a constant rate.

10.7 At the conclusion of the predetermined sampling period, return to each sampling location and close the canister valve. **DO NOT OVER-TIGHTEN THE VALVE.** If the canister <u>does have</u> a vacuum/pressure gauge attached, read the gauge, and record the value in the field log book. Disconnect the flow controller with attached sample inlet line with particulate matter filter from the canister. If the canister <u>does not have</u> a vacuum/ pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister. Note: **The gauge reading obtained in this step and in step 10.2 should agree with the predetermined final canister pressure used in the calculations described in Section 14.1.2. This step will help determine if the sample had been collected at a constant rate over the sampling period.**

10.8 In a field log book record for each sampling location, the sampling event end time, final canister pressure, and meteorological conditions during the sampling event.

10.9 For each sample fill in the tag attached to the canister within the following information: Date Sampled & Pressure (psig) see Appendix A.

10.10 Complete the chain-of-custody record form. See Section 14.5.

PART 3
Canister Pressurized Time-Integrated Sampling Procedures

11.0 Equipment and Supplies

See Figure 3 for a diagram of the canister pressurized time-integrated sampling system.

11.1 Sampling inlet line is made of chromatographic-grade stainless steel tubing to connect canister to sample inlet.

11.2 Sample canister is a stainless steel pressure vessel of desired volume (6-liter or 15-liter) with valve and either a SUMMA‘ passivated or Silco lined interior surface. All canisters mush be certified clean, leak free and evacuated prior to sampling event. Canisters can be purchased from Scientific Instrumentation Specialists (SIS), Andersen Instruments Inc., RESTEK, or equivalent. A vacuum/pressure gauge (0-30 in Hg and 0-30 psig) can be attached to canister as an option.

11.3 A separate vacuum/pressure gauge is used if not attached to the canister for taking vacuum/pressure readings before and after the sampling event.

11.4 A 2 micrometer stainless steel in-line particulate matter filter (Nupro Co., Model SS4F-2, or equivalent) is attached to sample inlet line.

11.5 A mechanical flow controller made of stainless steel; having a flow range of 2- 4 ml/min (Restek Veriflow model 423XL or equivalent) is calibrated to 3.3 ml/min. using a 6-liter canister to collect a 24-hour integrated sample.

11.6 A mechanical flow controller made of stainless steel; having a flow range of 5-500 ml/min (Millaflow model 423SXVT/HT or equivalent) is calibrated to 10 ml/min. using a 6-liter canister to collect an 8-hour integrated sample.

11.7 An Aalborg Electronic Mass Flow Meter (Model GFMs-010020) is used to calibrate the flow controller. The mass flow meter measures flow rates between 0 - 20 ml/min.

11.8 When an electrical outlet is not available an SIS stainless steel/viton diaphragm vacuum pump/compressor, model NO5SV, with a current draw at max load of 1.1 amps can be used with the following components.

11.8.1 Two Technacell rechargeable solid-gel cell 6 volt batteries, rated for 12 ampere hours connected in series to produce 12 volts.

11.8.2 A Micronta regulated 12 volt power supply, converts 120VAC to 12VDC.

11.8.3 A Pelican Products, Inc. Pro Case houses and protects the sampling pump, batteries, and power supply.

11.9 When an electrical outlet is available, use a Xontech Model 911A sampler and follow the procedures outlined in the EPA SOP, EPA-Reg1-ESD/Xontech-Can-Sam-SOP, July 2005.

12.0 Procedures

The standard operating procedure (SOP) described below outlines the procedures used for collecting a pressurized integrated canister sample. Configure the sampler as shown in Figure 3 using the components described in Section 11.1 – 11.8.

Follow the procedures outlined in the EPA SOP, EPA-Reg1-ESD/Xontech-Can-Sam-SOP, July 2005 when using the Xontech Model 911A sampler and available electrical outlet.

12.1 In the laboratory, prior to the sampling event, calibrate the flow controller using the procedure outlined in Section 14.1. **Note: For this procedure use an evacuated dummy canister.**

12.2 Select the canister and flow controller to be used for the sampling event and bring it to the desired sampling location. If the canister <u>does not have</u> a vacuum/ pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister. If the canister to be used for the sampling event <u>does have</u> a vacuum/pressure gauge attached, read the gauge and record value and canister number in field log book.

12.3 Connect the sample inlet line with particulate matter filter to the inlet/vacuum side of the pump. Connect the outlet/pressure side of the pump to the high pressure inlet port (HP) of the flow controller. Connect the low pressure outlet port (LP) side of the flow controller to the canister inlet port. Refer to Figure 3 for a diagram of the sampler.

12.4 In a field log book record the project name, sampling event date, sampling location, canister number, sampler number, and the initial canister pressure gauge reading.

12.5 After all of the samplers have been set-up at their desired sampling locations, go back to each location and first turn on the sampling pump then open the canister valve. In the field log book record the sampling event start time for each sampling location.

12.6 During the course of the sampling event, periodically check each sampling location to see if the sampler had been tampered with or that the pump is running. In addition, if the canister has a vacuum/pressure gauge attached, observe and record the gauge reading to determine if the canister is being filled at a constant rate.

12.7 At the conclusion of the predetermined sampling period, return to each sampling location and first close the canister valve then turn off the sampling pump. **DO NOT OVER-TIGHTEN THE VALVE.** Disconnect the sampler from the canister. If the canister <u>does not have</u> a vacuum/ pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister. If the canister <u>does have</u> a vacuum/pressure gauge attached, read the gauge and record the value and in the field log book. **Note: The gauge reading obtained in this step and in step 12.2 should agree with the predetermined final canister pressure used in the calculations described in Section 14.1.2. This step will help determine if the sample had been collected at a constant rate over the sampling period.**

12.8 In a field log book record for each sampling location, the sampling event end time, final canister pressure, and meteorological conditions during the sampling event.

12.9 For each sample fill in the tag attached to the canister within the following information: Date Sampled & Pressure (psig) see Appendix A.

12.10 Complete the chain-of-custody record form. See Section 14.5.

13.0 Data and Records Management

All data and information pertaining to this SOP are recorded by hand in a permanently bound notebook in black or blue ink and on the canister tag.

14.0 Quality Control and Quality Assurance

The following describes the QA/QC procedures and performance criteria used to collect canister air samples.

14.1 Flow Controller Calibration

The canister sampling system uses either a Millaflow model SC423SXFT/B or Restek Veriflow model 423XL flow controller to regulate the flow of sample entering the canister over the desired sample period. The flow controller is calibrated using an Aalborg Electronic Mass Flow Meter (Model GFMs-010020) capable of measuring flow rates between 0 - 20 ml/min. Pre-sampling event flow controller calibration procedures for sub-atmospheric and pressurized canister samples are described in Sections 14.1.3 and 14.1.4, respectively.

14.1.2 Flow Rate Determination

Flow rates are determined based on the duration of the sampling event and whether sub-atmospheric or pressurized samples will be collected. Flow rates can be calculated using the following formula:

$$F = \frac{P \times V}{T \times 60}$$

F = flow rate (ml/min)
P = final canister pressure, atmospheres absolute

$$= \frac{\text{gauge pressure (psig)} + 14.7 \text{ psig}}{14.7 \text{ psia}}$$

V = volume of canister (ml)
T = sampling period (hours)

For example, if a 6 liter canister is to be pressurized to 26 psig in 8 hours, the flow rate should be calculated as follows:

$$\text{Flow Rate (ml/min)} = \frac{\frac{(26 \text{ psig} + 14.7 \text{ psig})}{14.7 \text{ psia}} \times 6{,}000 \text{ ml}}{8 \text{ hours} \times 60}$$

$$= \frac{2.8 \text{ atmospheres absolute} \times 6{,}000 \text{ ml}}{480 \text{ min}}$$

$$= 35 \text{ ml/min}$$

For example, using a 6 liter canister to collect a sub-atmospheric pressure sample to -6 inches of mercury vacuum in 8 hours, the flow rate should be calculated as follows:

$$\text{Flow Rate (ml/min)} = \frac{\frac{(-6 \text{ inches of Hg} + 29.92 \text{ inches of Hg})}{29.92 \text{ inches of Hg}} \times 6{,}000 \text{ ml}}{8 \text{ hours} \times 60 \text{ min}}$$

$$= \frac{0.80 \text{ atmospheres absolute} \times 6{,}000 \text{ ml}}{480 \text{ min}}$$

$$= 10 \text{ ml/min}$$

14.1.3 Sub-atmospheric Canister Laboratory Flow Controller Calibration Procedures

14.1.3.1 On the inlet side of the Aalborg Electronic Mass Flow Meter (Model GFMs-010020) connect the 7 micrometer stainless steel Nupro Co. particulate filter supplied with the flow meter.

14.1.3.2 Power up the Aalborg Electronic Mass Flow Meter (Model GFMs-010020) by connecting it to the power supply. **Note: The meter must be warmed up for a minimum of 10 minutes prior to taking readings.**

14.1.3.3 Using an insulated screwdriver, through the ZERO (lower) access window adjust the trim potentiometer until the display reads zero.

14.1.3.4 Configure the sampler as shown in Figure 2 using the components described in Section 9.0. Connect the sample inlet line with particulate matter filter to the flow controller's high pressure inlet port (HP), if not already configured and the low pressure outlet port (LP) to the canister inlet port. **Note: This canister will serve as a dummy canister for calibrating all the flow controllers to be used during the sampling event.**

14.1.3.5 Connect the flow meter to the sample inlet making sure the "FLOW ARROW" marked on the flow meter is pointing in the right direction.

14.1.3.6 In a field log book record the project name, calibration date, and flow controller number.

14.1.3.7 Open the canister valve to allow a sample of room air or clean/background ambient air to be drawn through the flow meter and into the canister. The canister pressure differential causes the sample to flow into the canister.

14.1.3.8 Observe the mass flow meter reading and adjust the micro metering valve on the flow controller until the predetermined flow rate registers on the meter. In the field log book record the flow rate reading. Refer to Section 14.1.2 for the procedure to calculate flow rates. **Note: With the mechanical flow controller, the difference between the inlet and outlet pressure must be 10 psi to maintain a constant flow rate. As the internal canister pressure approaches atmospheric**

pressure, there will be a decrease in the flow rate. Therefore, a 6 liter canister will only be able to collect a 2 - 3 liter sample.

14.1.3.9 Close the canister valve. **DO NOT OVER-TIGHTEN THE VALVE.**

14.1.3.10 Turn off (unless it will be used for further calibrations) and disconnect the Aalborg Electronic Mass Flow Meter from the sample inlet.

14.1.3.11 Disconnect the flow controller with sample inlet line and particulate matter filter from the canister.

14.1.3.12 Place the flow controller in its carrying case.

14.1.4 Pressurized Canister Laboratory Flow Controller Calibration Procedures

14.1.4.1 On the inlet side of the Aalborg Electronic Mass Flow Meter (Model GFMs-010020) connect the 7 micrometer stainless steel Nupro Co. particulate filter supplied with the flow meter.

14.1.4.2 Power up the Aalborg Electronic Mass Flow Meter (Model GFMs-010020) by connecting it to the power supply. **Note: The meter must be warmed up for a minimum of 10 minutes prior to taking readings.**

14.1.4.2 Using an insulated screwdriver, through the ZERO (lower) access window adjust the trim potentiometer until the display reads zero.

14.1.4.4 Configure the sampler as shown in Figure 3 using the components described in Section 11.0. Connect the sample inlet line with particulate matter filter to the flow controller's high pressure inlet port (HP), if not already configured and the low pressure outlet port (LP) to the canister inlet port. **Note: This canister will serve as a dummy canister for calibrating all the flow controllers to be used during the sampling event.**

14.1.4.5 Connect the flow meter to the sample inlet making sure the "FLOW ARROW" marked on the flow meter is pointing in the right direction.

14.1.4.6 Power up the pump, open the canister valve to allow a sample of room air or clean/background ambient air to be drawn into the canister.

14.1.4.7 Observe the mass flow meter reading and adjust the micro metering valve on the flow controller until the predetermined flow rate registers on the meter. In the field log book record the flow rate reading. Refer to Section 14.1.2 for the procedure to calculate flow rates.

14.1.4.8 Close the canister valve. **DO NOT OVER-TIGHTEN THE VALVE.**

14.1.4.9 Turn off the pump and flow meter (unless it will be used for further calibrations).

14.1.4.10 Disconnect the flow meter from the sample inlet.

14.1.4.11 Disconnect the sampler from the canister.

14.1.4.12 Place the flow controller and sampler in their appropriate carrying cases.

14.1.4.13 After all the flow controllers are calibrated, clean them according to the procedures described in the Flow Controller Cleaning SOP, Revision #0, 09/13/07.

14.2 Field/Trip Blank

There will be no canister field/trip blanks brought back to the laboratory for analyses. All the canisters and samplers designated for a specific project are certified clean and leak free by the Region I OEME Laboratory prior to sample collection. The cleaning and leak certification procedures are described under separate cover in SOP documents, EPASOP-CanisterClenaing.SOP.Rev3 and ECASOP-CanisterLeak.SOP.Rev3. This process eliminates the need to have field/trip blanks analyzed with canister samples.

14.3 Duplicate Samples

Every sampling event, at one sampling location two canisters are collected in parallel over the same period of time. In the final report compounds having values above their reporting limits are reported in a summary table along with the RPD . The RPD must agree within $\pm$ 25%, if not, the concentration of the identified compound will be reported as an estimated value. This criterion will only apply if concentrations are 10 times the reporting limit.

14.4 Canister Storage

Canisters that have been certified clean and leak free are stored in the EPA Region I OEME Laboratory on the shelves located in the hallway outside Room 173. Several days prior to the sampling event canisters are evacuated to their final canister pressure. After the sampling event and after being logged into the laboratory, the canister samples are stored in the EPA Region I OEME Laboratory on the shelves located in the hallway outside Room 173.

14.5 Canister Transport

Canisters are transported to the field and back to the laboratory in either metal carrying cases or cardboard boxes designed to handle 6-liter or 15-liter canisters. The carrying case helps eliminate valves on the canisters from being inadvertently opened and/or damaged.

14.6 Chain-of-Custody

A chain-of-custody record form accompanies the samples from the point of sample collection to the point of analyses. The field engineer enters the following information on the chain-of-custody record form (copy provided in Appendix B) at the completion of the sampling event:

- Project/Site Name
- Samplers Signature
- Station Numbers
- Date
- Station Location Description
- Remarks: canister number and any other pertinent information

The field engineer returns to the laboratory, stores the canisters on the shelves located in the hallway outside Room 173 and contacts Doris Guzman or another authorized person to transfer sample custody. At that time, the engineer signs and enters the date/time on the chain-of-custody record form, relinquishing the samples to the authorized login person, who also signs and enters the date/time on the form.

15.0 Waste Management and Pollution Prevention

No hazardous waste will be generated as a result of following this SOP.

16.0 Preventative Maintenance

Maintenance will be needed if the parameters described in the SOP are outside the stated limits. Contact Peter Kahn for any maintenance related questions.

17.0 References

NA

TABLE 1

EPA REGION I METHOD TO15 TARGET VOC LIST

1,1,1-Trichloroethane	Dibromochloromethane
1,1,2,2-Tetrachloroethane	Dichlorodifluoromethane (F12)
1,1,2-Trichloroethane	Dichlorotetrafluoroethane
1,1-Dichloroethane	Ethyl Benzene
1,1-Dichloroethylene	Heptane
1,2,4-Trichlorobenzene	Hexachloro-1,3-butadiene
1,2,4-Trimethylbenzene	Hexane
1,2-Dibromoethane	Isopropyl Alcohol
1,2-Dichlorobenzene	Methyl Ethyl Ketone
1,2-Dichloroethane	Methyl Isobutyl Ketone
1,2-Dichloropropane	Methyl-t-butyl ether
1,3,5-Trimethylbenzene	Methyl Bromide (Bromomethane)
1,3-Butadiene	Methyl Chloride (Chloromethane)
1,3-Dichlorobenzene	Methylene Chloride
1,4-Dichlorobenzene	Styrene
2-Hexanone	Tetrachloroethene
4-Ethyl Toluene	Tetrahydrofuran
Acetone	Toluene
Acrylonitrile	Trichloroethene
Allyl Chloride	Trichlorofluoromethane
Benzene	Trichlorotrifluoroethane
Benzylchloride	Vinyl Bromide
Bromodichloromethane	Vinyl Chloride
Bromoform	cis-1,2-Dichloroethene
Carbon Tetrachloride	cis-1,3-Dichloropropene
Chlorobenzene	m,p-Xylene
Chloroethane	o-Xylene
Chloroform	trans-1,2-Dichloroethene
Cyclohexane	trans-1,3-Dichloropropene

FIGURE 1

CANISTER GRAB AIR SAMPLER CONFIGURATION

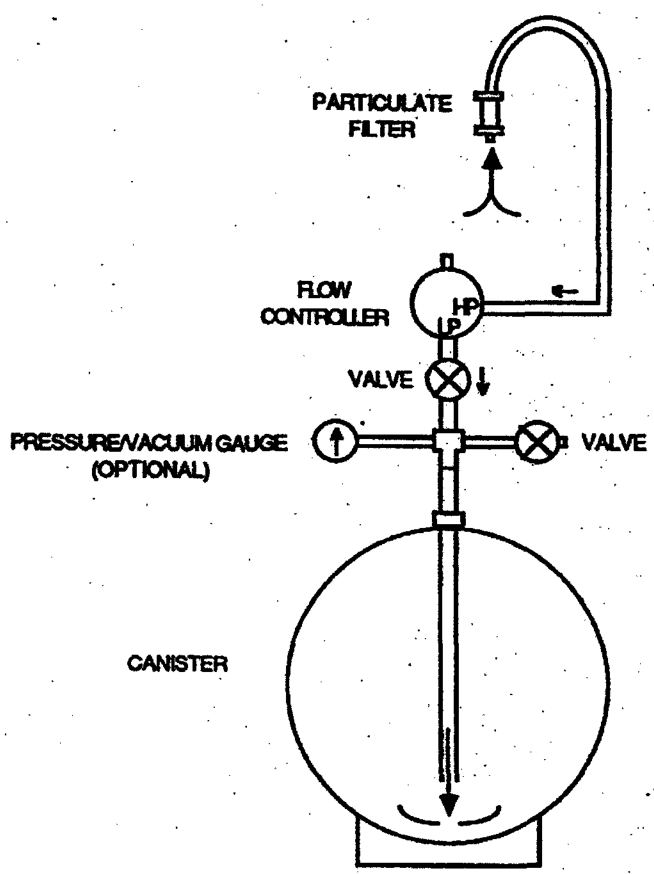


FIGURE 2

CANISTER SUBATMOSPHERIC TIME-INTERGRATED AIR SAMPLER CONFIGURATION

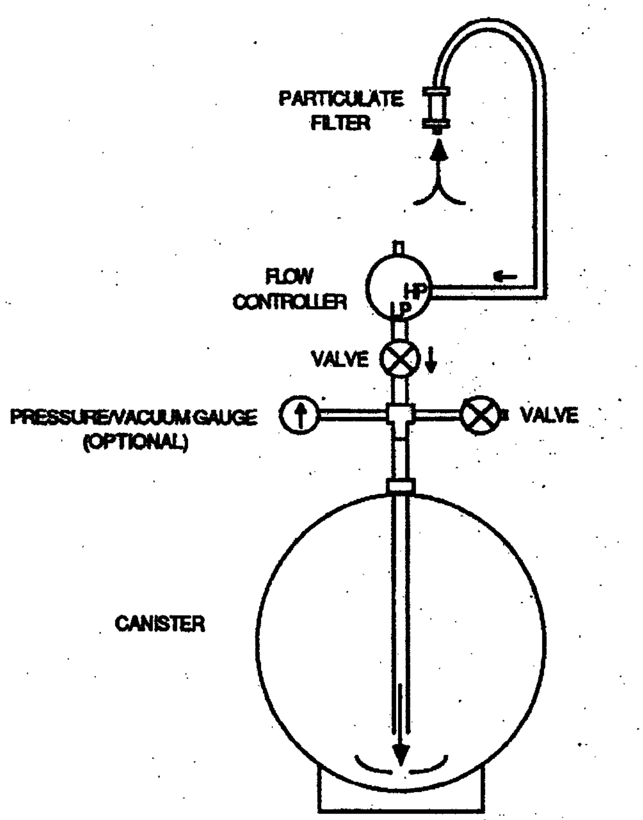
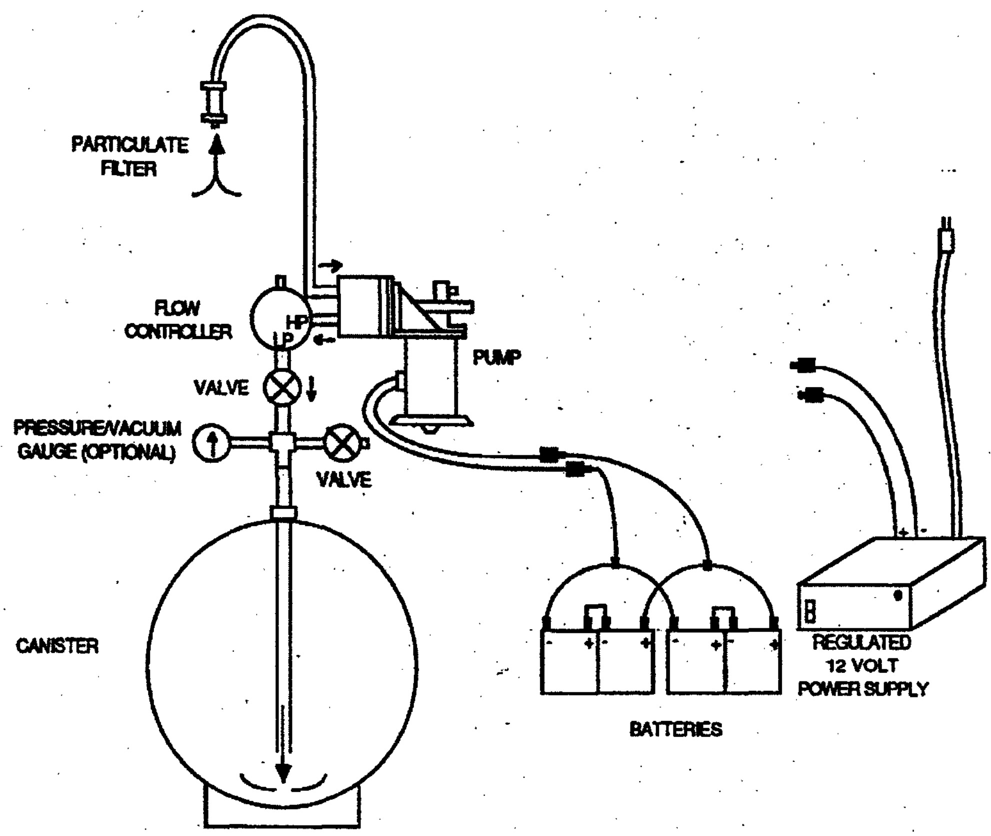


FIGURE 3

CANISTER PRESSURIZED TIME-INTERGRATED AIR SAMPLER CONFIGURATION



APPENDIX A

CANISTER TAG EXAMPLE

Tracking Information

Canister Numbers ________________
Date Cleaned: ________________
Date Vacuum Leak Certification: ________________
Volume of Water Added (ul): ________________
Date Pressurized to 45 psia: ________________
Date Certified: ________________
Date Final Pump down: ________________
Date Sample and Pressure (psig): ________________
Date Analyzed and Pressure (psig): ________________

Mailing Address

US EPA
11 Technology Drive
N. Chelmsford, MA 01863

Survey Name: ________________________________

Toxics ________________ **PAMS** ________________

APPENDIX B

CHAIN-OF-CUSTODY FORM EXAMPLE

ENVIRONMENTAL PROTECTION AGENCY

EXAMPLE

CHAIN OF CUSTODY RECORD

REGION 1 – ESD
60 WESTVIEW STREET
LEXINGTON, MA 02173

PROJ. NO: 0705004 PROJECT NAME: Alexson's Cleaners

SAMPLERS: (Signature)

STA. NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	CANISTER NUMBER	REMARKS Air Toxics
	5/1/07				1 Bougie Lane	1	2570	Basement Indoor Air 24-hr
	5/1/07				1 Bougie Lane	2	2153	Basement Indoor Air 24-hr Dup
	5/2/07				1 Bougie Lane	1	2567	Basement Indoor Air Grab
	5/1/07				1 Bougie Lane	1	5046	Ambient Air 24-hr
	5/1/07				37 High Street	1	3490	Basement Indoor Air 24-hr
	5/1/07				39 High Street	1	5055	Basement Indoor Air 24-hr

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Peter R Kahn	5/4/07 8:46				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
			5/4/07 8:46		

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